

## Curriculum Vita

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### **Roger S. Pulwarty Ph.D.**

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**Education:** BS Atmospheric Sciences (w/Honors.1986). York University. Toronto, Canada  
PhD (Geography, 1994). University of Colorado, Boulder.

### **Employment:**

07/2017-Present: Senior Scientist. NOAA Ocean and Atmospheric Research, Earth System Research Laboratory Physical Sciences Division Boulder, Colorado  
07/2016-07/2017: Senior Science Advisor for Climate Research NOAA Climate Program Office.  
07/2007-08/2016: Director, National Integrated Drought Information System  
08/2010-04/2014: Director, Climate and Societal Interactions Division NOAA Climate Program Office  
06/2002-06/2007: Deputy Director, Western Water Assessment, CIRES University of Colorado  
10/1998-05/2002: Director: Regional Integrated Sciences and Assessments  
NOAA Office of Global Programs. Silver Spring MD.  
09/1994-09/1998: Research Scientist III CIRES University of Colorado, Boulder

### **Selected Professional Activities and Committee Memberships:**

Fellow, American Meteorological Society; American Geophysical Union Natural Hazards Committee; Sequoyah Fellow, American Indian Society for Science and Engineering; Interagency Working Group on Traditional Ecological Knowledge; Western States Water Council Federal Advisory Committee; White House Task Force on Water, Energy and Food Security (co-Chair 2016-2017); White House Task Force on Climate and National Security (Adaptation Chair 2016-2017); International Geographic Union (Commission on Climatology)

Professor-Adjunct University of the West Indies and University of Colorado;

U.S. Congress testimonies on climate adaptation, water resources, drought and early warning;

Chair: Sustainable Development Goal 6: U.S. Water and Sanitation;

Chair: WMO Global Framework on Climate Services Climate Services Information System Implementation Team

WMO International Drought Management Program Management Group; Global Climate Observing System Steering Committee (2012-2017); WMO Commission on Climatology Management Group; GEO Water Resources Task Team

### **National and International Assessments:**

Convening Lead Author: UN IPCC AR5 Working Group II, Lead Author: AR5 SPM; IPCC SREX Chapters 2, 5 and SPM 2012; UNISDR Global Assessment of Disaster Risk Reduction 2011; IPCC Technical Paper Climate and Water Resources 2008; Chapter 7: (Adaptation Practices) IPCC AR4 Working Group II 2007 Convening Lead Author US Fourth National Climate Assessment 2018. Adaptation chapter; Lead Author: Water; Caribbean Region; Third National Climate Assessment: Indicators 2014; Global Climate Impacts in the United States 2009; Weather and Climate Extremes in a Changing Climate. 2008;

**Awards:** U.S. Department of Commerce Silver (2014, 2019) and Gold Medals (2010); NOAA Administrator's Award (2009, 2014); Gold Medal (Applied Sciences) Trinidad and Tobago

National Institute for Science and Technology/Caribbean Academy of Sciences (2013); American Geophysical Union Gilbert White Lecture and Award (2016); Aspen Global Change Institute Walter Orr Roberts Lecture (2018), CIRES University of Colorado Distinguished Lecture (2017), Global Adaptation Forum Opening Keynote (2016), Rotterdam), University of the West Indies National Institute for Science and Technology Public Lecture (2015). Over 50 national and international Invited Keynote Lectures and Public Presentations (i.e. not including professional conferences and workshop presentations). Fellow, American Meteorological Society

**Selected Peer-reviewed Publications:** Keywords: climate extremes, climate services, early warning, disaster risk reduction, risk management

Pulwarty, R. Easterling, D, J. Adkins 2020: Financial services for climate risk management in the US. In Cutter S and A. Graubard (eds) *Oxford Research Encyclopedia, Natural Hazard Science* Oxford University Press (in review)

Hewitt, C., S. Mason, Pulwarty, R. et al 2020 Making society climate-resilient: international progress under the Global Framework for Climate Services. *Bulletin of the American Meteorological Society* (in press)

Pendergrass, A., Meehl, G., Pulwarty and others: 2019: Flash droughts: High-impact events that present a new challenge for S2S prediction. *Nature Climate Change* (in press)

Allis, E., Hewitt, C., Pulwarty, R. et al, 2019: The Future of Climate Services. WMO For the 21<sup>st</sup> Century WMO Bulletin **68**, 50-59

Linkov and Pulwarty, 2019 The business case for water infrastructure resilience. OECD and IADB (30 pages) Presented June 2019. This White Paper formed the basis of the OECD Report Water -related investment: the case for resilience OECD Paris 12 pp.

Pulwarty, R., Erian, W., Vogt, J., 2019: Drought. In UN Office for Disaster Risk Reduction Global Assessment Report UN Press Geneva, Switzerland

Vogt, J.V., Naumann, G., Masante, D., Spinoni, J., Cammalleri, C., Erian, W., Pischke, F., Pulwarty, R., Barbosa, P., 2018: Drought Risk Assessment and Management. A conceptual Framework. EUR 29464 EN, European Union, Luxembourg, 2018. ISBN 978-92-79-97469-4, doi:10.2760/057223, JRC113937

Goodman S., Pulwarty, R. Risi, L and A. King, 2018, Improving Predictive Capabilities for Security Related Disruptive Water and Weather Events Wilson Center Report 60 pages

Linkov, Pulwarty The business case for water infrastructure resilience. OECD and IADB (30 pages) Presented June 2019. This White Paper formed the basis of the OECD Report Water -related investment: the case for resilience OECD Paris 12 pp.

Gould, W.A., ...Pulwarty, R., ...et al 2018: U.S. Caribbean. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA. doi: [10.7930/NCA4.2018.CH20](https://doi.org/10.7930/NCA4.2018.CH20)

Lall, U., Pulwarty, R... et al 2018: Water. Chapter 3 In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R. et al (eds)]. U.S. Global Change Research Program, Washington, DC, USA. doi: [10.7930/NCA4.2018.CH3](https://doi.org/10.7930/NCA4.2018.CH3)

Lempert, R., Arnold, J., Pulwarty, R., et al., 2018: Reducing Risks Through Adaptation Actions. Chapter 28 In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., et al U.S. Global Change Research Program, Washington, DC, USA. doi: [10.7930/NCA4.2018.CH28](https://doi.org/10.7930/NCA4.2018.CH28)

Linkov and Pulwarty, 2018 A tiered approach to resilience assessment *Risk Analysis* 38, 1772-1780

Wilhite, D., and R. Pulwarty 2017: Drought and water: Lessons drawn, some lessons learned, and the road ahead. In Wilhite D. and R. Pulwarty (eds) *Drought and Water Crises: Integrating Science, Management and Policy* 2<sup>nd</sup> Edition CRC Press Taylor and Francis pp. 513-525

Wilhite D. and R. Pulwarty (eds) *Drought and Water Crises: Integrating*

*Science, Management and Policy* 2<sup>nd</sup> Edition CRC Press Taylor and Francis pp. 513-525

Heim, R. M. Brewer, Pulwarty, R. Wilhite, D, Hayes, M, and M. Sivakumar, 2017: Drought

Early Warning and Information Systems. Chapter 17 in Eslamian S.(eds) *Handbook of Drought and Water Scarcity: Principles of Drought and Water Scarcity* CRC Press pp.305-322

Van Lanen, H.A.J., Vogt, J.V., Pulwarty, R., others 2017. Climatological risk: Droughts. In:

Poljanšek, K., (Eds.). *Science for Disaster Risk Management: Knowing Better and*

*Losing Less*: EUR 28034 EN, Publications Office of the European Union, Luxembourg

Melis, T., S.Jain, Korman, J., R. Pulwarty, 2016, Using Large-Scale Flow Experiments to Rehabilitate Colorado River Ecosystem Function in Grand Canyon: Basis for an Adaptive Climate-Resilient Strategy In: K. Miller (ed) *Water Policy and Planning* CRC Press pp.315-346

Wiener, J, R. Pulwarty, D. Ware, 2016: Bark without bite: The socio-economic context of the 1950s drought. *Weather and Climate Extremes* **11**, 80-94

Wood, E. Schubert, S. Wood, A, Peters-Lidard, C., Mo, K., Mariotti, A and R. S. Pulwarty,

2015: Prospects for advancing drought understanding, monitoring, and prediction. *J.*

*Hydrometeor*, **16**, 1636–1657

Joyette, A, L. Nurse, R. Pulwarty 2015: Disaster risk insurance and catastrophe models in risk-prone Caribbean islands. *Disasters* **39**, 3, 467–492

Pulwarty, R. Maia, R. 2015: Adaptation challenges in complex rivers around the world: The Guadiana and the Colorado Basins. *Water Resources Management* **29**, 273-293

Ralph, F.M., Dettinger, M.D., Pulwarty, R., others 2014, A vision of future observations for western US extreme precipitation and flooding: *Jour. Cont. Water Resources* **153**, 16-32.

Wilhite, D. M. Sivakumar, R. Pulwarty, 2014: Managing drought risk in a changing climate: The role of National Drought Policy. *Weather and Climate Extremes* **3**, 4-13

Vaughan, L. J. Furlow, W. Higgins, C. Nierenberg, R. Pulwarty, 2014 US Investments in International Climate Research and Applications *Earth Perspectives* 2014, **1**:23

Mimura, N., Pulwarty R.(CLAs) Duc, D., Elshinnawy, I. Redsteer, M., Huang, H., Nkem, J.,

Sanchez-Rodriguez, R., 2014: Adaptation Planning and Implementation. Chapter 15 In:

*Climate Change 2014: IPCC Working Group II Impacts, Adaptation and Vulnerability*. IPCC Fifth Assessment Report Cambridge University Press

Pulwarty, R., M. Sivakumar, 2014: Information systems in a changing climate. *Weather and Climate Extremes* **3**, 14-21

Birkmann, J. S. Cutter, ...R. Pulwarty, 2013: Scenarios for vulnerability: Opportunity and constraints in the context of climate change and disaster risk management. *Climatic Change*

**121**, 1-16 doi:10.1007/s10584-013-0913-2, online first

Sivakumar, M. D. Wilhite, R. Pulwarty, R. Stefanski, 2013: The High-Level Ministerial Meeting and Declaration on National Drought Policy (HMNDP). *Bull. Amer. Meteor. Soc.* 94

Moss, R, Behar, D....R. Pulwarty, (and 15 authors) 2013: Come hell and high water: The need

- for practice-relevant climate adaptation science. *Science* **432**, 696-698
- Pozzi, W. ....Pulwarty, R. (co-authors), 2013: Towards Global Drought Early Warning Capability: Expanding international cooperation for the development of a framework for global drought monitoring and forecasting *Bull. Amer. Met. Soc.* **94**, 776-785
- Mariotti, A, Schubert, S., Pulwarty, R, Huang, J., Barrie, D, 2013: Advancing drought understanding, monitoring and prediction. *Bull. American. Met. Soc.* **94**, 186-188
- Pulwarty, R., and J. Verdin, 2013: Crafting early warning systems. In Birkmann J(ed) *Measuring Vulnerability to Natural Hazards: Disaster Resilient Societies* UNU Press Tokyo pp.124-147
- Cardona, O. van Aalst, Birkmann, J, Fordham, M., McGregor, G., Perez, R Pulwarty, R., Schipper, L., Bach Tan Sinh, 2012: Determinants of Risk: Exposure and Vulnerability. Chapter 2 In *IPCC Managing the Risks of Extremes and Disaster to Advance Climate Change Adaptation*. Cambridge Press pp. 65-108
- Cutter, S. Osman-Elasha, B Campbell, J., So-Min Cheong, S., McCormick, S., Pulwarty, R., Supratid, S., Ziervogel, G., 2012: Managing the Risks from Climate Extremes at the Local Level. Chapter 5 in *IPCC Special Report on Managing the Risks of Extremes and Disaster to Advance Climate Change Adaptation*. Cambridge Press pp. 291-338
- Martinez, R. Hemming, D., Pulwarty, R., and others, 2012: Improving climate risk management at local levels-case studies, good practices and guidelines for WMO Members. In N.Banatiene (ed) *Risk Management: Current Issues and Challenges* InTech Electronic Books pp. 477-532
- Pulwarty, R, Eilerts, and J. Verdin, 2012: Food security in a changing climate. *Solutions* **3**, 31-34
- Pulwarty, R. L. Nurse, U. Trotz, 2010: Caribbean Islands in a Changing Climate *Environment* **52**, 16-27
- Kenney, D., A. Ray, B. Harding, R. Pulwarty, and B. Udall, 2010: Rethinking vulnerability on the Colorado River. *J. Contemp. Water Res.* **144**, 5-10,
- Pulwarty, R., C., Simpson, and C., Nierenberg, 2009: Regional Integrated Sciences and Assessments (RISAs): Crafting assessments for the long haul. In Knight, Jager, J, (eds) *Integrated Regional Assessments of Global Climate Change*. Cambridge Press 367-394
- Schubert, S...R. Pulwarty et al, 2009: CLIVAR Project to assess and compare the responses of global climate models to drought-related SST forcing patterns. *J. Climate*, **22**, 5251-5272
- Meehl G., Goddard, L.R. Pulwarty, ... et al, 2009: Decadal prediction, can it be skillful?, *Bull. Amer. Meteor. Soc.*, **90**, 1467-1485
- Pulwarty, R and N. Hutchinson, 2009: Technical Guidance Manual for Conducting and Mainstreaming Vulnerability and Capacity Assessments in the Caribbean. Caribbean Community Climate Change Centre and CARICOM 60 pp. [www.caribbeanclimate.bz](http://www.caribbeanclimate.bz)
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- Dalrymple, K, and R. Pulwarty, 2006: Sea-level rise implications for the coast of Guyana: Sea walls and muddy coasts. *International Latin American and Caribbean Engineering and Technology (LACCET)*. p.1-10 (refereed paper)
- Pyke, C., and R., Pulwarty, 2006: Elements of effective decision support for water resources management under a changing climate. *Water Resources* **8**, 8-10
- Poveda, G., Waylen, P, and R., Pulwarty 2006: Annual and inter-annual variability of the present climate in northern South America and southern Mesoamerica. *PALAEO* **234**, 3-27
- Pulwarty, R., Jacobs, K., Dole, R., 2005: The hardest working river: Drought and critical water problems on the Colorado. In D. Wilhite (ed): *Drought and Water Crises (1st ed)*. Taylor and Francis Press pp. 249-285

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- Jacobs, K., and Pulwarty, R., 2004: Climate, science and decision making in water resources. In Lawford, R., (eds): Water: Science, Policy and Management. AGU Press 177-204
- Ambrizzi, T., E., Souza, and R. Pulwarty, 2004: The Hadley and Walker regional circulations and associated ENSO impacts on South American seasonal rainfall. In Diaz, H and R., Bradley,(eds): The Hadley Circulation: Past, Present and Future Kluwer Press 203-238
- Pulwarty, R., K., Broad, T., Finan 2003: ENSO forecasts and decision making in Brazil and Peru. In Bankoff, G., et al (Eds.) Mapping Vulnerability: Disasters, Development and People. Earthscan Publ. pp. 83-98
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- Meehl, G. A., T. Karl, D. R. Easterling, R. Pulwarty, others 2000: An introduction to trends in extreme weather and climate events: Observations, socioeconomic impacts, terrestrial ecological impacts, and model projections. *Bull. Amer. Meteor. Soc.* **81**, 413-416
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- Pulwarty, R.S. 1999: Hurricane impacts in the context of climate variability, climate change and coastal management policy. In, Downing T., Olsthoorn, A. and, R. Tol, (Eds): Climate, Change and Risk. Routledge, London pp. 173-204
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- Pulwarty, R., Barry, R., Hurst, C., Sellinger, K., and L., Mogollon, 1998: Precipitation on the Venezuelan Andes. *Meteorology and Atmospheric Physics* **16**, 217-237
- Pulwarty, R., Eischeid, J., and H. Pulwarty, 1998: Climate impacts on the sugar industry in the Caribbean: In, Gilbes, F.ed, Inter-American Institute: Caribbean Country Needs. CoHEMIS University of Puerto Rico, Mayaguez pp. 117-130 (add West Indian Sugar Technologists Conference 2001)
- Pulwarty, R. and K., Redmond, 1997: Climate and salmon restoration in the Columbia River basin: role and usability of seasonal forecasts. *Bull. Amer. Meteor. Soc.* **78**, 381-397
- Pielke, R., Kimpel, J., Pulwarty, R., et al 1997: The U.S. Weather Research Program: Societal Impacts. *Bull. Amer. Meteor. Soc.* **79**, 867-876
- Pulwarty R, and W. Riebsame, 1997: The political ecology of hurricanes in the Caribbean. In Diaz, H., Pulwarty, R. (Eds), 1997: Hurricanes: Climate and Socio-economic impacts Springer-Verlag Pub. Heidelberg 307 pp. *Re-released in paperback 2012*

Diaz, H., and R. Pulwarty, 1997: Decadal Climate Variability, Atlantic Hurricanes, and Societal Impacts: An Overview In Diaz and Pulwarty (eds) p.3-14

Diaz, H., and R. Pulwarty (eds) 1997: Hurricanes: Climate and Socio-economic Impacts. Springer

Diaz, H.F., and Pulwarty, R., 1994: An analysis of the time-scales of variability in centuries-long ENSO-sensitive records. *Climatic Change*, **26**, 317-342

Pulwarty, R., Barry, R.G., Riehl, H.R., 1992: Annual and seasonal patterns of rainfall variability in Venezuela. *Erdkunde*, **46**(3/4): 273-289

Diaz, H.F., Pulwarty, R., 1992: A comparison of Southern Oscillation and El Niño event signals.

In: Diaz, H., and Markgraf, V., (Eds), 1992: *El Niño* Cambridge University Press, pp.174-192

Pulwarty, R, and Cohen, S; 1984: Possible effects of CO2-induced climate change on the world food system: a review. *Climatological Bulletin* **18**, 33-48